Comparison and Application of different Echo Reduction Techniques in Antenna Measurement

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Abstract:
During the last years, different methods for improving the quality of the antenna measurements results have been developed, in particular for echo reduction. This paper is a common research work between Universidad Politécnica de Madrid and Microwave Vision Group whose objective is the comparison of different echo reduction techniques in order to be able to explote the advantages of each one in antenna measurements applications. In particular, these techniques are specially important for outdoor antenna measurement systems, for systems as the StarLab (where the measurement equipement is placed without full coverage of absorbing material) or for measurements at lower frequencies where the performance of the absorbing material is not good enough. These techniques are based on spatial filtering, modal filtering and time gating techniques. The paper analyzes different approaches: in particular for spatial filtering, holographic techniques [1] and source reconstruction based on integral equations [2] are analyzed. In the first case, the field is back propagated to a large planar surface containing the antenna under test, and the fields out of the antenna area are filtered out. The main advantage is the very small time required for the transformation, while the disadvantages are focused on the specific applications for planar antennas and the need of geometrical information to improve the results. The second algorithm, based on source reconstruction using integral equation (in particular the authors analyzed MVG INSIGHT© algorithm). The main disadvantage is the time consumption, although the results are better accurate than the previous one. In the case of modal filtering, there are different approaches, with similar theoretical basis. This paper uses the approach included in MV-Echo© [3] for the cancellation of the echos based on the spherical modes decomposition of the radiated field. The last group of algorithms are based on time filtering. In particular FFT [4], Matrix Pencil method [5] and non uniform DFT are used. In all the cases, the results are similar. The first algortihm requires uniformly frequency spaced samples (not always available) but it is faster. In these three cases, the main disadvantage is the number of frequencies (and step) required for having a good echo reduction. The different algorithms have been applied to the measurement of a dipole antenna (SD1900) in the MVI StarLab System. Results show that depending on the angular range of the pattern the improvements are better or worst using any of the methods. Results will be shown in the final paper or presentation.

References:

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